responses and from Discovery announcement messages that are independent from its own Discovery query message transmissions.

**[0166]** MAC with NAN Support

**[0167]** The MAC is responsible for acquiring and maintaining time and frequency synchronization among devices that are close by, so that the devices are available for discovery protocol message exchange in same channel at same time. Synchronization happens through dedicated synchronization frames that are transmitted by so called master devices (on default) at the beginning of the availability periods. Sync frames are transmitted periodically in certain channels. Periodicity and channel usage is determined by sync frame parameters. Each device needs to be capable of acting as a master device and each device is expected to determine for each availability period whether it is a master device or not. This determination is done through a master election algorithm. The synchronization frames determine the schedule (time and frequency) of both the synchronization frame transmissions and the availability periods or discovery windows.

**[0168]** A NAN network is comprised of a set of NAN devices that operate under a common network identifier (NAN ID) and that share common sync frame and discovery window parameters. A NAN network comprises of one or more NAN clusters. Each NAN cluster may be a contention group or beacon group and may be considered a local representation of a NAN network. A NAN cluster is comprised of a set of NAN devices that operate in a NAN network with one NAN ID and which are synchronized with respect to both the sync frame transmissions and the discovery windows. In order for NAN devices to form a NAN cluster, at least some of them need to be within range of each other. The NAN ID is carried at least in synchronization frames that may be of a beacon frame format. Each beacon contains a NAN ID field that is used in a NAN device receiving a beacon, to determine, as an example, whether the beacon is from a NAN network in which the NAN device is operating and from what type of NAN network the beacon was transmitted. In one embodiment of the invention, the NAN ID is a numerical value that is indicated with a 6-octet field in beacons or in synchronization frames used in the NAN networks, to provide basic synchronization within NAN clusters. In one embodiment of the invention, there is no NAN cluster identifier that would be carried in beacon frames, but NAN cells are differentiated with different schedules especially from perspective of sync frame (beacon) schedule.

**[0169]** Basic Principles of NAN Operations:

**[0170]** Upon activating the NAN functions in a device, the device first looks for a NAN network by means of passive discovery. The NAN functions are activated by an application in the device requesting either the Subscribe or the Publish service to be activated, when there is no service active in the NAN Discovery Engine.

**[0171]** a) On default there is at least one NAN ID that is determined in a NAN specification and the NAN device looks for such a network and its clusters.

**[0172]** Joining a NAN network/NAN cluster: If the device finds at least one NAN cluster that the device may join, the device selects a cluster and joins it. If the device finds no NAN cluster that the device may join, the device establishes a NAN cluster of its own. An application may have also requested the Publish service to be activated in a passive mode. In such case the device doesn't ever establish a NAN cluster, but it only operates in NAN clusters that have been established by others.

**[0173]** a) A NAN device may join a NAN cluster when the following criterion is met:

**[0174]** 1. The device receives at least one sync frame from the cluster with signal level exceeding a pre-determined threshold RSSI_C (e.g. −50 dBm).

**[0175]** Upon joining a NAN cluster a NAN device synchronizes itself both to the sync frame transmission and discovery window schedule of the cluster.

**[0176]** a) Additionally, the device is responsible for running the master election algorithm to determine whether it is a master device that is responsible for transmitting a sync frame.

**[0177]** Once in a NAN cluster, a NAN device may continue operating in it, as long as one of the following criteria is met:

**[0178]** a) The device receives at least one sync frame from the cluster with signal level exceeding a predetermined threshold RSSI_C (e.g. −50 dBm).

**[0179]** b) The device operates as a master device transmitting sync frames.

**[0180]** When operating in a NAN cluster, a NAN device is responsible for maintaining both the base clock of the cluster by transmitting sync frames as needed and the discovery window schedule of the cluster.

**[0181]** Additionally, a NAN device is responsible for conducting passive discovery once a while to figure out whether there are other NAN clusters within range that that the device should consider joining.

**[0182]** a) When a NAN device detects a sync frame of a NAN cluster different from the one in which the device operates, but both the clusters belong to the NAN network the device operates in, and the sync frame is received with signal level exceeding a predetermined threshold RSSI_C (e.g. −50 dBm), the device proceeds as follows:

**[0183]** 1. If the sync frame from the foreign cluster contains parameter values that indicate preference of the foreign cluster over one's own cluster, the device moves its operations to the foreign cluster.

**[0184]** 2. Otherwise the device continues its operations in the current cluster.

**[0185]** Neighbor Awareness Networking Network

**[0186]** A NAN network is comprised of a set of NAN devices that operate under a common network identifier (NAN ID) and that share common sync frame and discovery window parameters.

**[0187]** A NAN network is comprised of one or more NAN clusters.

**[0188]** In accordance with an example embodiment of the invention, two NAN network types are defined:

**[0189]** a) Network of synchronized clusters.

**[0190]** b) Network of isolated clusters.

**[0191]** Network identifier (NAN ID) depends on the network type.

**[0192]** a) In a preferred implementation the NAN specification determines at least two NAN ID values and for each ID value the specification also determines the network type.

**[0193]** The network type determines whether discovery window schedules are aligned across cluster borders (network of synchronized clusters) or whether discovery